CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1885-86.

No. 2422 of 1886.

From

E. C. OZANNE, Esquire,
Director of Agriculture,
Bombay;

To

The SECRETARY to GOVERNMENT,
Revenue Department.

Poona, 29th October 1886.

Sir,

I have the honour to submit herewith through the Commissioners of Divisions the usual analysis of crop experiments carried out by Revenue Officers during the year 1885-86.

2. Expenditure on crop experiments was interdicted on account of financial pressure in Government Resolution No. 4466, dated 3rd June 1885, but a small sanction was afterwards granted for the conduct of experiments on selected crops in selected districts (Government Resolution No. 86, dated 7th January 1886). The number of experiments is therefore small—too small to justify attempts at generalizations of results. I submit the reports for record and for reference, with a request that the compilation may be circulated as usual.

3. I have separately solicited orders that to ensure correctness in the calculation of the equivalent in weight of the contents of the local *ser* of capacity, experimenters may be requested to send with the bill of costs samples of the grain experimented with; each sample being a full local *ser*, measured as directed by standing orders. This request was necessitated by inaccuracies still abundant, arising from misapprehension and confusion such as that described in pages 8 and 9 of the report for 1884-85.

4. There is one other point on which orders are requested. Column 12 of the standard form prescribed for the use of experimenters, demands the entry of the local estimate of the crop in annas. It has been found that various and contradictory interpretations have been made regarding this estimate. It is clearly intended that the estimate should throw light on the incidence of the assessment on the gross value of the produce, and not on the character of the crop of the field experimented upon, in comparison with other similar crops of the táluka or village or holding. Such comparison is of course very valuable and should not be neglected. But the special entry in the estimate column should be an estimate of the crop actually tested in comparison with the produce of other years of the same field. The entry should mean that the crop is so much below or above or is equal to the average yield of that field. With this estimate the incidence shown in column 29 will be explained. The variation of custom regarding the figure in the anna scale chosen to denote an average crop causes another complication. Whereas in the Presidency it is usual to denote such a crop by 12 annas it is in some places the custom to denote the average crop by 16 or 14 annas. The 'remarks' column should therefore contain an explanatory note thus: "Average crop locally denoted by——annas. The crop experimented on is estimated as shown in column 12 at——annas for the field of experiment." Then should follow comparison of the crop of this field with other similar crops of the season in the holding, village or táluka.

5. I have endeavoured to bring together in this analysis the results of former experiments on the selected crops and to compare the results obtained with the figures of the Crop Formulæ. As has been noticed (paragraph 5 of report submitting experiments of 1883-84), one of the main objects of the experiments is to throw light on the correctness or otherwise of the formulæ

estimates. Till the average yield of the various crops in various tracts is approximately known, all attempts at calculating the yield of even the food grains of the Presidency will be futile.

6. Some confusion has arisen from the use of the word 'special' in the directions regarding the experiments on selected crops in selected tracts. Some experimenters thought that they were called on to make "special" experiments within the meaning given in the standing orders but only "ordinary" experiments were required. A "special" experiment on any particular crop would be meaningless, for the "special" experiment is by the definition an experiment on a holding.

I have the honour to be,
Sir,
Your most obedient Servant,
E. C. OZANNE,
Director of Agriculture.

ANALYSIS OF CROP EXPERIMENTS.—BOMBAY PRESIDENCY, 1885-86.

A.—Selected Crops in Selected Districts.

(1) Wheat.

This crop is attracting special attention owing to the export demand that has arisen of late years. An attempt was made this year to secure specially careful experiments in the principal wheat growing centres in order that light might be thrown on differences in characteristics, modes of cultivation and yield. Experiments were made in Ahmadabad, Khándesh, Násik and Dhárwár.

2. *Ahmadabad.*—Wheat is largely grown in the western tálukás of this district and in the adjoining tracts of the Káthiáwár States, and it is also largely exported.

3. The irrigated variety—*vájia*—is a soft red. The dry-crop or *chásia* varieties are the *dáudkháni* hard white and the *kátha* hard red. The latter is usually grown continuously and without manure on land locally called "bhál" land which is more or less impregnated with salt. It is a hard red with a very short straw, so short indeed that it is not customary to bind the pulled crop into sheaves. The *dáudkháni* is grown on black soil alternating with cotton. It is seldom manured and except that it is a white wheat, differs little in characteristics from the other chásia variety. The *vájia* or irrigated kind is generally manured and is taken in rotation with other crops. In Broach and Cambay in "bhál" land the same continuous unmanured *kátha* is common but in Hánsot táluka of Broach and in Olpád of Surat a very fine quality of hard white wheat is largely cultivated. It is styled *Hánsia*, and is locally prized both on account of its colour, and its keeping qualities. The local demand is so great that it does not find its way to the export market. Here and there it shows a tendency to change of colour and consistency. Where it assumes a reddish tinge—probably in certain soils, it is called *kátha*, but this *kátha* is quite distinct from the *kátha* of the "bhál" land. Where in a season of large rainfall it is softer than usual, it is called *potha* and is then very similar to *dáudkháni*, though the grain is larger.

4. In Khándesh the dry-crop wheat is a hard red with a large grain, while the irrigated kind is a hard white called *Bansi* though this latter apparently (*see* Experiments Nos. 8 and 9) is grown as a dry-crop also. In Násik and Ahmadnagar the unirrigated variety is generally a hard white or yellow (*pivla*) though in some soils it is red (*kátha*). In all three districts wet seasons produce a softer kind which is, as in Gujarát, called *potha*. In Khándesh both dry-crop and irrigated wheat are taken in rotation with other crops and manure is applied to wheat or to some other crop of the course. On the other hand in Násik and Ahmadnagar the dry-crop wheat is not manured, though it is not grown continuously. In black soil it takes its turn with other rabi crops such as gram and jowári. In lighter soil it is grown alternately with a kharíf crop of bájri mixed with various pulses. It is almost invariably sown with occasional rows of safflower in Násik and Ahmadnagar. The irrigated variety of these two districts as of the rest of the Deccan, is also a fine large hard white or yellow called *Bakshi*, identical with the irrigated *bansi* of Khándesh. This wheat is grown as a dry-crop in the elevated plateau of the Párner táluka of Ahmadnagar. It is readily distinguished from the dry-crop hard white or *pivla*—of the Deccan—in the field by its black awns (*kále kusal*) and in the sample by a characteristic glaze. Its quality is very high, but its cultivation is greatly lessened by an undoubtedly great liability to rust. On this account a kindred grain spelt (Maráthi *khapli* or *jod*) is more commonly cultivated in irrigated lands. The grain is narrow, long and pointed. It claims almost complete immunity from rust. It is usually classed as a hard red wheat. The glumes adhere to the grain and it can only be cleaned by pounding. In the Southern Marátha Country the wheat grown

in rotation with cotton is nearly all dry-crop and is all hard red much larger than the kátha of Gujarát bhál lands. Spelt is also cultivated, where irrigation is available.

5. This slight sketch is attempted with some diffidence, for the uncertainty of vernacular names of varieties and the difficulty of securing accurate accounts of characteristics and modes of cultivation, makes it impossible to describe even so well known a crop as wheat with confidence.

6. The variation in yield is considerable as will readily be supposed from the description given above. In a pamphlet called the "Wheat Production and Trade of India" published in 1883 by the Government of India, it was sought to give to the public some information as to the characteristics and yield of various varieties of wheat in various tracts. The question of yield was especially under consideration in this Presidency in the same year when a committee of experts drew up as fully and as accurately as could be done from recorded information and personal experience, formulæ showing variations in yield in the different districts and tálukás of Bombay. In the formulæ the bumper yield of each táluka was entered at 16 annas. The 16-anna yield represented the best crop in the best land, in a good season and under the best system of cultivation known in the táluka. Abnormal and extraordinary yields which experiments had shown to have been now and then secured were, however, excluded. The recorded figures in the formulæ will indicate the variation in outturn:—

No.	District.	Dry-crop wheat.	Irrigated wheat.	Spelt.
		Lbs.	Lbs.	Lbs.
1	Ahmadabad	1,100 to 1,200	1,900 to 2,100	.....
2	Broach	1,200 to 1,300	.....	.....
3	Khándesh	900 to 1,000	1,350	1,800
4	Ahmadnagar...	800 to 1,000	Do.	Do.
5	Násik...	Do.	Do.	Do.
6	Dhárwár	Do.	1,300	Do.

7. As far as the Deccan and Southern Marátha Country are concerned, I am inclined to accept these estimates as fairly trustworthy, but they appear too high altogether for the "bhál" lands of Ahmadabad and Broach. I have collated experimental results obtained since 1878-79 as far as available:—

AHMADABAD EXPERIMENTS.

Unmanured Dry-crop Wheat.

Táluka.	Year.	Yield per Acre.		Assessment.	Incidence of assessment on gross produce.	Local valuation.	Remarks.
		Grain.	Straw.				
		Lbs.	Lbs.	Rs. a. p.			
Dhandhuka	1878-79 ...	379	245	2 12 0	13·1	...	Under average of season.
Do.	Do. ...	454	301	3 0 0	12·5	...	Above do.
Dholka	1882-83 ...	515	533	2 10 8	14·4	12 as.	
Sánand	Do. ...	484	714	0 14 0	4·55	14 as.	Continuous wheat
Do.	Do. ...	361	346	1 2 0	13·1	12 as.	(kátha).
Dholka	1883-84 ...	640	400	1 15 7	7·13	..	
Do.	Do. ...	548	320	1 8 8	7·02	16 as.	
Viramgám	Do. ...	650	880	1 9 3	6 6	...	Good year, wheat alternating with cotton, (Dáudkháni).
Do.	Do. ...	648	753	1 1 4	4·7	...	
Do.	Do. ...	475	520	1 3 7	8·24	...	
Viramgám	1884 85 ...	650	880	1 9 3	6 6	...	Alternating with cotton.
Do.	Do. ...	646	753	1 1 4	4·7	...	Do.
Do.	Do. ...	475	520	1 3 7	8·24	...	Do.
Dhandhuka	1885-86 ..	401	289	1 1 3	11·01	14 as.	Yield decreased by rust.

Irrigated and Manured.

Táluka	Year.	Yield per Acre		Assessment.	Incidence of assessment on gross produce	Local valuation.	Remarks
		Grain.	Straw.				
		Lbs	Lbs	Rs. a p			
Dholka	1882 83	1,107	1,066	5 6 4	13 00	12 as	
Sánand	Do ...	1,020	800	4 7 9	11 36	12 as	
Dholka .. .	1883-84 ...	1,512	865	4 13 0	8 66	16 as	*Kádri* or embanked land
Dhandhuka	Do	1,230	1,730	0 5 10	98	16 as	Temporary well, no water charge,
Do	Do. ..	1,346	1,986	6 0 0	14 40	16 as	
Daskroi	1884 85 .	1,202	1,430	3 3 4	7·88	..	

It seems from these figures that the yield of the Ahmadabad wheats has been over-estimated. It also appears from the fact that the dry-crop varieties are not manured and are grown continuously, that so large a yield as that set down in the formulæ is very improbable.

The experiment for 1885-86 is shown in detail in the Tabular Statement (No. 1). It was made on a large area (30 gunthás) by an experimenter who has had considerable experience. It must be noticed that by the custom of the district 14 annas is taken to represent an average crop and not 12 annas as is generally the custom in the Presidency.

8. *Násik.*—The Násik Experiment (No. 16) shows a yield much above the bumper yield of the formulæ for the táluka, though it is described as an average one only. The extraordinarily low yields reported from this district for the two previous years were fully noticed in my reports. Just as these appeared to demand explanation, so does the very high yield now reported. The season of 1885-86 was in Násik less favourable than 1883-84. The following figures show the results reported from this district:—

Na'sik Experiments.

Dry-crop Wheat.

Táluka	Year.	Yield.		Assessment	Incidence of assessment on gross produce	Local valuation.	Remarks
		Grain.	Straw.				
		Lbs.	Lbs.	Rs. a p.			
Dindori	1883 84 ..	550	...	0 11 9	5 10	16 as.	Very good season
Niphád	Do ..	385	..	1 14 7	20 80	16 as.	
Do	1884-85 ..	468	480	1 2 2	11 07	12 as	Good season
Do	Do	465	560	1 2 8	11 35	12 as	
Dindori	Do ...	579	560	1 0 0	7 05	14 as	
Do	Do .	280	306	1 1 0	15 00	8 as	
Niphád	1885 86 .	1,167	1,453	1 5 2	4 12	12 as.	Do.

A special order has been given by Government directing a large number of experiments on wheat and other staple crops in this district with a view to reconcile these apparently irreconcileable results.

9. *Khándesh.*—In experiment No. 7 Mr. Hughes reaped a whole field of 13 acres 14 gunthás, and there is no reason to doubt the accuracy of the recorded results which moreover tally generally with the formulæ. Mr. Shridhar Gundo sends in two ordinary experiments on wheat (Nos. 8 and 9) and the results of a test (No. 10) taken in connection with a special experiment which has however been treated as an ordinary one.

10. In the Southern Marátha Country three experiments were made. I personally took two tests in Bijápur. One in the Don valley gave a very large outturn, higher than the 16-anna yield of the formulæ, which for the Bágevádi táluka is 1,200 lbs. Here wheat follows gram and is followed by late (white) jowári in a three-year shift. But occasionally when the rains are early and good, early

(red) jowári is sown with mug and rows of túr. The crop was attacked with rust, but it completely recovered and was not injured in quality or quantity. In the 3 acres 28 gunthás of the field of experiment, 28 gunthás by measurement were so completely overrun with *hariáli* that no attempt was made to sow this portion. The figure for column 9 was therefore found by dividing the total assessment by the area sown. The crop is always mixed with rows of safflower, but the same amount of seed of the principal crop is used whether sown alone or with occasional rows of the subordinate crop. To eliminate the complication arising from the row crop I have divided the area proportionately (*see* No. 23, Tabular Statement). Thus 8 gunthás contained really only 7 gunthás of wheat. The local ser measure contains 153 tolás of wheat or 116 tolás of safflower seed. The straw in this rich jowári tract is only used for thatching. The crop is pulled and the long straw is kept whole for this purpose. I append (*see* Appendix A) an estimate of the cost of cultivation, containing some general information. I took the weight of 4 local sers 3 days after the crop was reaped and kept the wheat for 6 months to ascertain the loss by dryage. This amounted to less than 1 per cent, which is a clear proof that the cultivators reap their wheat dead ripe. The weight per bushel is 64½ lbs.

(2) Sugarcane.

11. Inasmuch as under the authority of Government Resolution No. 2885, dated 15th April 1886, Revenue Department, I have invited special reports on this crop in which the experimental results of various years will be incorporated, I need only briefly review the experiments made in 1885-86. They are shown in the Tabular Statement in detail. Mr. Snow's experiment (No. 17) on cane close to Poona manured with cowdung and sweepings was very carefully made. The yield is very high, more than the 16-anna yield of the formulæ, which is very probable, because the cultivation is certainly more careful than the average cultivation of the táluka. It would be very interesting to have the results of a similar experiment on similar land manured with poudrette. Mr. Woodward's experiment (No. 18) is on a very similar variety of cane, but cultivated in a very different manner. The irrigation is from a stream on the banks of which a rough well or *budki* is made temporarily and the water is raised by the lever and bucket lift worked by hand (4 men). Mr. Lucas' experiment (No. 25) above the ghâts in Kánara shows a very high yield. The figures are hardly credible for the cane was grown with only a flooding of water before planting.

The cost of cultivation as estimated by Mr. Snow bears evidence of accuracy and will be used for the summary under separate preparation as noticed above.

(3) Tobacco.

12. Tobacco was also selected for especial enquiry, the districts chosen being Kaira in Gujarát and Belgaum in the Southern Marátha Country, where tobacco is a specially important crop. The response to the call has been satisfactory. Mr. Kennedy in Kaira who has had great experience with tobacco added two more careful tests to those which he had previously made, while from Belgaum 2 experiments are reported. There is on record a series of reports made in 1873, on the cultivation of tobacco which give very detailed information. These reports are summarized in the volumes of the Gazetteer. I need not repeat what is already available in published records, but would draw attention to the preparation of the seed nursery. This is either manured with sheep dung (brought on to the land and not obtained by folding sheep, as sometimes seed nurseries for rice are prepared in the Konkan) or by burning layers of brushwood and grass very much in the manner in which generally the rice seed-beds are prepared in the Konkan. The virtues of ráb are the subject of much contention at the present time in the Konkan, and in the preparation of the tobacco seed-beds we have instances of what are there styled *kachcha* or unburnt and *pakka* or burnt ráb. I may notice on the authority of Mr. Cabaniss, Assistant Director of Agriculture in Burmah, that in America the tobacco nurseries are similarly rábed but there with logs of wood burnt on the seed-bed. In Nadiád the young seedlings are sometimes top-dressed with castor-oil cake, when owing to excess of rain or other cause the seedlings show signs of distress. This fact is reported by Mr. Behechardás Viháridás Desái, one of the highest authorities on tobacco in Gujarát.

13. I notice from a report by Mr. C. Benson, Assistant Director of Agriculture, Madras, that in the rich tobacco districts of the Krishna and Godávari deltas the seed-bed is prepared by *folding* sheep. The point is worthy of the attention of Nadiád cultivators. This folding of sheep is practised in the Southern Marátha Country also. The compilation of 1873 shows that the tobacco in Belgaum is also raised from seedlings reared in a nursery. But in neither of the experiments now reported is a description of the preparation of the seed-bed given, the seedlings in both cases having been purchased. It may be taken that seedlings are always raised in a nursery though in the compilation of 1873 it is stated that in places the seed is sown broadcast. The context shows that this sowing refers to the seed-bed, where of course the seeds are sown broadcast.

14. Tobacco is grown continuously in some parts especially in Kaira and in Sind, whence it is reported that the produce from continuous tobacco is highly prized. In Belgaum it is grown in rotation once in 3 years. It is grown both with and without irrigation, though in either case the seed-bed requires a sprinkling of water, when the rain holds off. Tobacco is always manured. Goat dung seems to be specially valued for its cultivation. The principal object appears to be quantity, rather than quality.

15. As regards yield Mr. Behechardás Desái considers that the average produce of the "Charotar"—a rich alluvial tract of Nadiád, the head-quarters of tobacco cultivation in Gujarát, is about 1,600 pounds per acre of tobacco cured for the local market. The compilation of 1873 gives the produce at 1,200 pounds. The formulæ estimate the 16-anna crop at 4,400 pounds, or if the 12 anna-entry of the formulæ be taken to represent an average crop, 3,300 pounds on the average. In none of these estimates is a separate estimate given for dry and irrigated tobacco and in the formulæ it is not stated whether the estimate is for cured tobacco or tobacco fresh cut.

16. As regards Belgaum, the yield in the compilation is recorded as 280 lbs. per acre, though it is noted that in Chikodi, the best tobacco tract, it reaches 420 lbs. per acre in a first rate season. The formulæ give the 16-anna estimate at 3,000 lbs. for the Chikodi and Gokák tálukás.

17. I shall now show the results of experiments made since 1881-82 :—

KAIRA EXPERIMENTS.

Tobacco.

Táluka.	Year.	Yield.	Value.	Assessment.	Incidence of assessment on gross produce.	Local valuation.	Remarks.
		Lbs.	Rs. a. p.	Rs. a. p.			
Borsad ...	1881-82 ...	1,577	160 0 0	12 4 0	7·6		Irrigated.
Nadiád ...	1884-85 ...	1,435	143 0 0	5 6 9	3·77		Irrigated from a well outside the field, no water-rate in column 5.
Nadiád ..	1885-86 ...	1,928	205 0 0	10 5 6	5·02		Continuous tobacco. Irrigated.
Borsad ...	Do. ...	2,119	142 0 0	8 2 3	5·73		Do. do. do.

N.B.—The weight of the fresh cut tobacco in these last two experiments was 7,290 lbs. and 8,530 lbs. respectively, from which it is clear that the estimate of the formulæ is for *cured tobacco.*

BELGAUM EXPERIMENTS.

Tobacco.

Chikodi ...	1884-85 ...	799¼	..	...	.....	12 as. ...	*See* Crop Experiment Report, 1884-85, p. 71.
Do. ...	1885-86 ..	315	30 3 6	1 6 5	4·63	16 as. ...	Tobacco. Dry-crop, last grown on this land 10 years ago. Black soil.
Gokák ..	Do. ...	1,087	92 5 6	2 3 8	2·4	10 as. ...	Dry-crop. Black soil, yearly receiving silt deposit from flooding of the Ghatprabha.

The weights are for cured tobacco. Mr. Price, one of the framers of the formulæ, as noticed last year desires to amend the entry for tobacco by the substitution of 1,000 lbs. for 3,000 lbs. for a 16-anna crop. The experiments are certainly in favour of some modification.

18. I have not noticed the diseases of tobacco. One, a parasite feeding on the roots of all Solanaceæ and not on tobacco only—is called in Gujarát

"*Vakumba*" and in the Southern Marátha Country and Deccan "*bambaku.*" In places this parasite—which is a broom rape (Orobanche) prevents successful growth of tobacco except at long intervals. I saw a crop in the Bijápur district, so poor as not to pay the cutting, on land which had not grown tobacco for 7 years. There were more plants of the parasite than of tobacco. The owner said he had been rash in taking tobacco so soon again. In the face of these facts, it is curious that in Gujarát and Sind tobacco can be grown continuously for the parasite is well known.

(4) Linseed.

19. The last crop selected for special enquiry was linseed. It is in this country grown as an oil-seed and never for flax. It is a most delicate crop, suffering from various diseases, of which a fungoid disease probably rust is the most common. Even where the attack is slight and in appearance the crop has not suffered, it is found that the capsules are only partly filled and the yield is thus often reduced by half without apparent injury. It is sown alone in Khándesh, but in the Deccan and Southern Marátha Country chiefly as a row crop with wheat or gram and round the headlands. The framers of the formulæ credit the crop with a maximum yield of 500 lbs. in every táluka in which it is grown. In Khándesh it is sometimes taken as a late crop following bájri of the same season. Linseed has seldom been selected by experimenters and little is therefore on record as to its varying yield. In the season under report it was almost a complete failure in the Deccan and Southern Marátha Country from prevalence of the fungoid disease noticed above. An experiment was made in Dhárwár by Mr. H. R. Shirhatti which gave a yield on very poor soil (assessed at 14 annas 9 pies per acre full of limestone nodules and very shallow) of lbs. 33 per acre. It was here grown as a row crop. Jowári was sown with the 4-coulter drill and on every fourth row alternately gram and linseed were deposited on the sown jowári by the seed tube. The yield of 33 lbs. on every eighth row represents a yield of $9 \times 33 = 297$ lbs. on the acre of linseed. It will be interesting if this crop could be selected specially again this year, care being taken to note whether (1) it is the sole crop of the year, or (2) the second crop after an early crop, or (3) a row crop. In the last case the number of rows of linseed and of the principal crop sown with it should be noticed.

B.—Experiments on other Crops.

20. *Northern Division.*—In Ahmadabad Mr. Maconochie made three ordinary experiments which are shown (Nos. 2, 3 and 4) in the Tabular Statement. The preparation of the seed nursery for rice is not described nor its proportion per acre of rice.

The estimate for the fodder jowári (2 annas) is very low. The formulæ estimate 300 lbs. as the maximum grain yield of this variety. Apparently a confusion has arisen between the fodder jowári and that grown for grain. This is further presumable from the rate of seeding. As much as 70 lbs. per acre are sown for the *sundio*. The barley crop was very poor.

21. *Central Division.*—Besides the experiments on selected crops a few were made as shown on other crops. One on bájri by Mr. Shridhar Gundo and one on groundnut by Mr. L. G. Deshmukh have been rejected because the test area was below the prescribed minimum.

22. *Southern Division.*—Two experiments by Mr. Sorábji Padamji have been rejected on account of numerous discrepancies, which have been pointed out to that officer by the Collector and myself.

Mr. Shirhatti submitted two experiments besides the one reported (No. 22). One was on linseed. Though after-enquiry showed that the linseed was sown only on every 8th row of jowári which was the chief crop, no mention of the jowári was made. The other was on rice. I have not succeeded in obtaining the figure for column 9. Both experiments are excluded.

Mr. Charles submits a very careful special experiment which I have thought advisable to show in a summarized form. *See* Appendix B. The figures are shown in the Tabular Statement (No. 21).

TABULAR SUMMARIES.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	AHMADABAD.								
	Mr. Edalji Dosábhái, District Deputy Collector.							Original survey	
1	Dhandhuka (Sodhi) ...	Dry-crop wheat Chásia (Kátha) hard red. "	14 as.	50	401 grain.	289 straw.	9 12 8	1 1 3	11·01
	Mr. A. F. Maconochie, Assistant Collector.								
2	Sánand (Sánand) ...	Rice (Sutarsál).	10	...	1,670 paddy.	2,650 straw.	36 9 0	3 9 0	9·74
3	Do. do. ...	Jowári (Sundio).	2	30	182 grain.	2,155 straw.	24 6 0	1 6 9	5·83
4	Do. (Bhat)	Irrigated Barley.	Poor ...	65	885 grain.	818 straw.	18 12 0	1 14 5	10·15
	KAIRA.								
	Mr. R. M. Kennedy, Assistant Collector.								
5	Nadiád (Chakalási) ...	Tobacco (irrigated).	12	...	1,928 cured leaf.	...	205 6 0	10 5 6 including water-rates.	5·02
6	Borsad (Nápa)	Do. ...	10	...	2,119 do.	...	142 1 4	8 2 3 including water charges.	5·73

Northern Division, 1885-86.

Area of test.	Equivalent in *tolds* of measure *ser*.	Remarks.
11	12	13
A. g.		
0 30	Weight *ser* =40 tolás.	Unmanured black soil (bhál), growing wheat or cotton. Manure seldom, if ever, used. Season favourable but for cloudy weather at ripening time which diminished the yield. Land clean. Twice hand weeded. An average crop estimated locally at 14 annas.
0 8	Do. ...	Continuous rice, irrigated from a tank, in embanked land (kiári), grown from seedlings reared in a seed-bed. Manured in alternate years. Season not very favourable, as rain insufficient.
0 8	Do. ...	Jowári grown for fodder alternating with kodra. The kodra of the previous year was manured. This jowári is sown as an early rain crop. Soil black. Estimate of column 4 incorrect.
0 8	Do. ...	The land is gorádu, growing crops of wheat and barley alternately. The irrigation is from a well in an adjoining number on which Rs. 7 per bucket or *kos* is charged over and above the assessment giving Rs 2-5-0 per acre. Crop much damaged by white ants.
0 6	Do. ...	Tobacco irrigated from a well close by. Soil, gorádu. Rotation, continuous tobacco grown from seedlings raised in a seed-bed of ½ guntha for 29 gunthás, manured with one cart-load of sheep's manure and watered when rain held off. The nursery was planted in the first rains and the seedlings transplanted about the beginning of September. Manured at the rate of 21 cart-loads per acre in June. Cultivation average (good) and crop good though tobacco in the neighbouring places suffered from frost. The curing consisted in leaving the leaves spread out on the ground for 10 days, and then at night sprinkling with water. They were then weighed and packed for sale.
0 6	Do. ...	Tobacco grown on a similar kind of soil, irrigated from a well close by. Manured in June at 50 cart-loads per acre. Rotation, continuous tobacco grown from seedlings raised in a seed-bed of the same size and with the same treatment as No. 5, and the crop though slightly affected by frost was fair but the cultivation was inferior to that in No. 5 though the soil superior, the labour being hired; the tobacco, though at first appearing to have a finer and more luxuriant leaf, lost rapidly in weight during curing and was declared inferior.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	KHA'NDESH.								
	Mr. H. A. Hughes, Assistant Collector.							Original survey	
7	Chopda (Chopda)... ...	Dry-crop wheat, hard red.	16	63	716 grain.	1,045 straw.	20 13 6	1 13 11	8·98
	Mr. Shridhar Gundo, District Deputy Collector.								
8	Amalner (Amalner) ...	Do. 'bansi', hard white.	16	54	1,217 grain.	1,344 straw.	30 1 4	1 7 10	4·95
9	Do. do. ...	Do. ...	16	54	731 grain.	800 straw.	18 2 8	1 14 1	10·36
10	Do. do. ...	Do. 'kátha', hard red.	16	54	843 grain.	900 straw.	20 0 0	1 15 6	9·85
11	Do. (Amalgaon) ...	Linseed ...	10	17½	308 seed.	...	14 4 0	2 0 0	14·03
12	Do. do. ...	Do. ...	10	17½	345 seed.	...	15 12 0	2 0 7	12·93
	Mr. Leslie Moore, Assistant Collector.								
13	Jalgaon (Jalgaon) ...	Do. ...	8	15	449 seed.	...	21 1 4	1 13 4	8·70
14	Bhusával (Chinchkhed Budruk, Peta Edalabad).	Jowári 'Ananeri.'	14	12	896 grain.	600 straw.	22 0 0	1 1 9	5·04
	Mr. H. E. Winter, Assistant Collector.								
15	Pimpalner (Jaithan in Nizámpur Peta).	Bájri 'Surla'.	Not stated.	8·45	420 grain.	1,030 straw.	12 10 6	0 11 9	5·80
	NA'SIK.								
	Mr. V. B. Vádekar, District Deputy Collector.								
16	Niphád (Ugaon)	Dry-crop wheat (Pivla) hard yellow.	12	35	1,167 grain.	1,453 straw.	32 1 4	1 5 2	4·12
	POONA.								
	Mr. P. C. H. Snow, Assistant Collector.								
17	Haveli (Ghorpadí) ...	Sugarcane 'Punda.'	14	15,000 sets.	7,975 'Gul'.	19,000 tops and leaves.	484 14 4	1 15 4' assessment and 25 0 0 water-rates	5·56
								26 15 4	

Central Division, 1885-86.

Area of test.	Equivalent in *tolas* of measure *ser*.	Remarks.
11	12	13
A. g.		
13 14	140	Manured black soil, growing wheat in rotation with cotton, jowári and bájri. In this district jowári and bájri are kharíf crops. Season favourable; an average crop is locally called 16 annas.
0 10	142	Manured black soil, growing crops similar to those on land of last experiment. Good season and first rate black soil. The manure for the wheat was 18 cart-loads per acre.
0 10	142	Similar soil and close by, but unmanured for wheat. The experimenter attributes the difference in yield to the absence of manure in this case.
0 8	142	Unmanured first rate black soil, similar to that of the experiments Nos. 8 and 9.
0 10	121	Good black soil unmanured. Rotation 1 wheat, 2 jowári (kharíf), 3 linseed. Crop injured by rust.
0 10	121	Do. do. do.
0 10	120	Medium black soil. Manured.
0 10	142½	Soil partly black and partly brown (bardi). Manured 10 loads per acre. Season favourable to the crop. The straw appears very low. The figures are doubtful. The weight of the ser was reported at 70 tolás but a test made at the Khándesh Farm shows it to be double.
0 8	142½	Light soil (bardi), growing cotton when early rain favourable, otherwise bájri with a mixture of pulses (matb, hulga) and a sprinkling of ambádi. Early rains unfavourable and crop not sown till 1st September and later rain not sufficient. Field weedy, land manured 2 years before at the rate of about 20 loads per acre. Column 10 calculated on yield of bájri alone.
0 6	120	Unmanured black soil, growing wheat as a late crop and bájri mixed with pulses as an early crop in alternate years. Season favourable, though slight rust. Locally an average crop is called a 12-anna crop.
0 8	Weight *ser* =80 tolás.	Reddish soil. Heavily manured 160 cart-loads of farm yard manure per acre, costing Rs. 100. White large variety (Punda). Cane taken alternately with gram or groundnuts. Watered from canal, water-rate Rs. 25 per acre. Number of canes per acre 22,685 from 15,000 sets or cuttings (tipris) planted. Gul 16 per cent. of weight of juice. Weight of canes not given. Cost of cultivation by hired labour Rs. 368. Fuel, the trash of the cane only.

Summary of the Crop Experiment Reports,

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	BELGAUM.								
	Mr. H. Woodward, Assistant Collector.							Revision survey	
18	Sampgaon (Nágnur) ...	Sugarcane 'Bile rasaváli kabbu.'	14	5,000 sets.	3,620 'Gul.'	24,000 tops and leaves for fodder.	201 7 4	7 0 0	3·47
	Mr. Sorábji Padamji, Assistant Collector.								
19	Chikodi (Hukeri)... ...	Tobacco unirrigated.	16	...	315 cured leaves	...	30 3 6	1 6 5	4·63
	Mr. Gursidápa Virbasápa, District Deputy Collector.								
20	Gokák (Konnur)	Do. ...	10	4,410 seedlings.	1,087 do.	...	92 5 6	2 3 8	2·40
	DHA'RWA'R.								
	Mr. F. L. Charles, Assistant Collector.								
21	Kalghatgi (Bendigeri) ..	Rice 'Somsáli.'	4 to 5	47	495 paddy.	1,828 straw.	12 6 0	1 12 8	14·45
	Mr. H. R. Shirhatti, District Deputy Collector.								
22	Navalgund (Annigeri) ...	Dry-crop wheat, hard red.	8	22 lbs. wheat and 1½ lbs. safflower.	395 grain.	473 straw.	9 9 8	1 13 4	19·08

Southern Division, 1885-86.

Area of test.	Equivalent in *tolás* of measure *ser*.	Remarks.
11	12	13
A. g.		
0 5	...	Good black soil on the bank of stream whence irrigable by paikotta classed as garden (pátasthal). Cane taken in alternate years. Cultivation very clean and careful. Sheep folded on land and besides farm yard manure applied. Cost of cultivation estimated at Rs. 128 and net profit at Rs. 80 per acre.
6 38	Weight *ser* =20 tolás.	Good black soil, manured, growing cotton and chillies in rotation and a crop of tobacco about once in 10 years. Area not measured but whole jiráyat portion of field tested which is recorded at 6 acres 38 gunthás in the Survey Register.
0 8	Do.	Good black soil, unmanured, but yearly enriched by silt deposit from the Ghatprabha. Usual crops jowári and gram. Seedlings of tobacco purchased.
0 10	110	Somsáli, a medium quality of rice drilled with the 4-coulter drill on 29th April 1884. Grown continuously on land manured in alternate years. Not manured in the year of test. Soil mixed red and white (masabu). Field weedy on account of absence of the rolling of the standing crop (hodata) which was prevented by insufficient rain. The rain was especially deficient in the latter half of the monsoon. Proportion of straw very high in comparison with grain, also due to omission of the hodata (*see* also Appendix B).
3 27	148	Wheat with rows of safflower. Column 10 is calculated on the wheat alone. Soil deep black. Unmanured for several years. It grows cotton, wheat, and jowári in rotation.

No.	District, Táluka, Village and Experimenter.	Crop.	Local Estimate in Annas.	Average per Acre.					
				Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Percentage of Assessment on Value of Gross Produce.
					Principal Product.	By-Product.			
1	2	3	4	5	6	7	8	9	10
				Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
	BIJA'PUR.								
	Mr. E. C. Ozanne, Director of Agriculture.							Revision survey	
23	Bágovádi (Sátihál) ...	Dry-crop wheat, hard red.	14	38	1,503 grain.	2,366 straw.	29 8 0	1 10 8	5·65
24	Sindgi (Hipargi)	Do. ...	12	30	731 grain.	708 straw.	14 12 0	1 0 0	6·78
	KA'NARA.								
	Mr. A. Lucas, Assistant Collector.								
25	Supa (Havgi)	Sugarcane (Rasadáli).	13	25,000 sets.	6,343 'Gul'.	...	365 15 7	3 5 0	·90

Southern Division, 1885-86—continued.

Area of test.	Equivalent in *tolás* of measure *ser*.	Remarks.
11	12	13
A. g.		
0 8	153	Wheat with safflower in every 8th row. Area therefore divisible into 7 parts wheat and 1 safflower. Column 10 calculated on the wheat alone. The crop failed in the previous year and this accounts for the very high yield which was practically after a bare fallow. Land seldom manured but it is rich black soil of the Don valley. The crop was excellent but not the best in the village, and by the village standard was 14 annas, for the season. But this figure would probably be a bumper crop for the táluka. Column 7 is made up of 1,583 lbs. of long straw and 783 lbs. of chaff. The figure in column 11 includes 7 gunthás of wheat and 1 of safflower.
0 6	150	*See* Appendix A.
0 6	Weight *ser* =—20 tolás.	Sandy soil. Manured. 12 months' crop. Figures doubtful.

APPENDIX A.

Ordinary Crop Experiment at Hipargi, Táluka Sindgi, Bijápur District.

Soil.—Medium black—capable of growing both early and late crops but more suited to the latter. Cotton is the chief crop of this kind of land. It is sown in September and is, if possible, grown once in three years. In other years wheat or early jowári or gram is sown.

Cultivation.

The black soil is ploughed and cross ploughed with the 8-bullock plough once in about 10 years. The plough is followed by the heavy harrow, also drawn by 8 bullocks. The object is to clear the land from deep-rooted grasses (*kunda* and *hariáli*). These however are more thoroughly kept down by hand digging. After the field has been hand dug and picked the grasses are kept down for about 5 years. The heavy ploughing and harrowing keep it fairly clean for about the same number of years, and then hand digging must again be done. This digging is sometimes done by contract at the rate of Rs. 3 per bigha for hariáli and Rs. 4 for kunda. The bigha is ⅓rd of an acre. The land measure in use is the kurgi, *i.e.*, that area which can be sown by the 3 or 4-coulter drill in one day. The kurgi is larger therefore where the 4-coulter drill is used. At Hipargi it clearly very closely approximates 3 acres. 9 bighás=1 *kurgi*. The contract rate for the hand digging comes to Rs. 9 to 12 per acre. The Bijápur Gazetteer estimates the cost at Rs. 30 per acre. It may reach that sum where land has been long neglected. Poor rayats hand dig at leisure small patches of land year by year.

The deep ploughing is done at the rate of an acre in about 3 days and the after-harrowing takes as long. Taking the cost for 2 men and 8 bullocks at 12 annas a day :—

Cost.		Per acre.
Ploughing and cross ploughing...	Rs.	4 8 0
Harrowing	„	2 4 0
	Rs.	6 12 0

Labour is cheap and so the feed of cattle, usually, in this locality and considering local circumstances the charge fairly represents the actual cost to the rayat.

It is not an over-estimate to take Rs. 2 an acre a year as the cost of these periodical cleanings—a proof of the seriousness of the conflict which is waged in black soil against the arch enemies to good cultivation—kunda and hariáli. In addition a yearly harrowing is necessary before sowing. For wheat the land is harrowed sometimes as much as 7 times. For early jowári 2 or 3 suffice. No rule can be laid down. The light harrow is drawn by 2 bullocks and works an acre and a half a day.

For wheat the seven harrowings would thus cost about Rs. 1-5-0 at 3 annas an acre for each.

Sowing.—The drill (kurgi) is drawn by 2 bullocks and the seed is sown by the driver. The usual row crop of safflower with wheat is sown by another man who holds the seed tube (*yelsaddi*). A pair of light seed harrows (1 man and a pair of bullocks) cover up the sown seed. As stated above 3 acres are sown in a day.

Seed.—Wheat 24 sers (1 ser=150 tolás) and safflower 2 sers (1 ser=116 tolás) are sown per kurgi. The safflower is deposited on the outer furrow made by the drill. Rate per acre 30 lbs. wheat and 2 lbs. safflower.

Reaping.—The cost is usually calculated as equivalent to the cost of seed. Where labour is cheap this appears fair, and approximates the cost where the reaping is paid in kind at so many sheaves per hundred.

Threshing—This depends on the crop. The cost may be taken at 2 annas per Imperial maund (82 lbs.).

Winnowing.—Three men it is asserted will with a good breeze winnow 9 maunds a day. Wages are perhaps a little higher as the monsoon is drawing near and the cost may be put down at 9 annas or 1 anna per Imperial maund.

Wheat is not weeded or hoed or watched. Carting the crop home is so variable a charge that it is hard to assign a valuation.

Abstract for Crop experimented on.

		Per acre.
Annual charge for cleaning land	Rs.	2 0 0
Harrowing the land for wheat	„	1 5 0
Sowing and covering	„	0 5 0
Seed wheat 30 lbs., safflower 2 lbs.	„	0 9 0
Reaping	„	0 9 0
	Rs.	4 12 0
Add—		
Threshing and winnowing at 4 annas per Imperial maund...	Rs.	1 12 0
and, carting according to distance from village ...	„	0 4 0
About ½ ton of wheat in straw will be a cart-load. Total ...	Rs.	6 12 0

APPENDIX B.

Mr. Charles has sent an experiment on a holding of 9½ acres, of which 7 acres are continuously cultivated with medium varieties of rice and the rest apparently kept under grass.

Details.

A.	g.	
3	20	Somsáli rice, experimented on.
3	20	Hakalsáli.
2	20	Grass and pot kharáb (3 gunthás.)
9	20	Assessed at Rs. 17 or

Rs. 1-12-10 per acre. The maximum rice assessment for the village fixed at the revision survey is Rs. 8. The average assessment is Rs. 2. The field of experiment is thus a little below the average.

The holding is well chosen. It is cultivated by a rayat and his wife (with only married daughters residing with their husbands). The rayat has a harvest cart and 4 bullocks but no other cattle. He subsists solely on the produce of his field. He was in debt but is now clear.

The yield of *somsáli* rice was 180 sers per acre. That of *hakalsáli* which succeeds better in a year of insufficient rainfall, was in appearance better. The straw and the grass of the portion kept for grass go towards the feed of cattle, and sufficed for that purpose in the year of the experiment.

The gross produce of the holding may be taken at 1,260 sers of paddy.

Before considering the cash and grain deductions the cultivation must be described. The land is ploughed with the large 4-bullock plough (*ranti*) as soon as the crop is removed. In the hot season it is harrowed with the 4-bullock harrow (*harago kunti*) and then on the first rainfall again ploughed. The seed at the rate of 17 sers (=47 lbs.) is drilled with the 4-coulter drill (kurgi) drawn by one pair of oxen at the end of April and seed covered with the *hálláki* or seed harrow. When the crop is about 4 inches high it is bullock-hoed 4 times or oftener with the *yedi kunti*, between the rows to kill weeds. The rows are hand-weeded by hired labourers 10 or 20 at a time. It is estimated that the labour thus employed was equivalent to 100 men at 1 anna 9 pies a piece—working according to custom from noon to night. The late coarse grass on the headlands and embankments was cut by hired hands at an agreed cost of 40 sers of paddy. One very important operation was omitted, *viz.*, the mud-rolling (*hodata*). This consists in rolling the standing crop with a broad bar of wood hollowed on the lower side in the direction of its length, before the stems have hardened, while the field is full of water. Its object is two-fold. It checks the natural tendency of the crop to excessive growth of straw at the expense of the grain yield and thus corresponds to the transplantation of seedlings raised in a nursery, and it also keeps down weeds which have grown up since the bullock-hoeing and hand-weeding. The hodata cannot be done unless the rain is sufficient to flood the field with impounded water. In the case in point it was unavoidably omitted, with the natural result of a low proportion of grain to straw, or more correctly speaking a high yield of straw in proportion to grain.

This description of 'hodata' is taken partly from Mr. Charles' report and partly from independent enquiries made by myself. Mr. Charles justly values the operation but gives it credit only as a weed destroyer. He says "It is pulled over the rice and weeds when the field is deep in water. The weeds are pressed down and do not again rise or die under the water while the rice springs up and thrives." As to this it must not be forgotten that the weeds have before this stage already been twice weakened by the bullock-hoeing and the hand-weeding, and these facts only account for the superior power of recovery of the rice.

The rice crop is manured in alternate years. But though it is not so stated it is probable that some portion of the land of the experiment is yearly manured. The somsáli area was not manured this year and so probably the hakalsáli area was and this may partly account for its superior crop.

The cost of reaping, carrying and threshing is estimated at the cost of 240 sers of paddy. Details are not given.

In estimating the cost of home-labour Mr. Charles rightly does not deduct the amount of clean rice at 1½lbs. per day per adult, on the fair argument that with paddy selling at 16 sers per rupee the rayat would sell his rice and buy jowári and náchni at 60—80lbs. per rupee. The material is now obtained for grain and cash deductions from the gross outturn :—

	Rs.	a.	p.
Gross produce 1,260 sers at 16 sers per rupee ...	78	12	0
Hired labour for ploughing (40), harrowing (20), sowing (20), cutting grass (40) or in all 120 sers at 24 sers per rupee.	5	0	0
130 sers seed at 24 sers per rupee...	5	6	8
Reaping and stacking 240 sers at 16 sers per rupee ...	15	0	0
Baluta—Mhárs 80 sers, Blacksmith and Carpenter 8 sers each = 96 sers at 16 sers per rupee	6	0	0
Cash payments for weeding, 100 men at 1 anna 9 pies each.	10	15	0
Value of grain consumed at home at 3 lbs. a day at 60 lbs. per rupee	18	0	0
Local Funds	1	1	0
	61	6	8
Balance ...	17	5	4

This balance is not sufficient to pay the assessment Rs. 17 and charges on account of clothing, charity (Baluta to Pujári, Gurav, &c.,) and interest on capital laid out in purchase of live and dead stock. But the season was unfavourable and the outturn if anything under-estimated because the hakalsáli was the better crop.

Some interesting details as to the various products of somsáli rice are given. 2 sers of paddy (bhatta) weighed 5 lbs. 9 oz.

By grinding the products were :—

	Lbs.	oz.		Per cent.	Mr. Muir's last year.
Akki or clean whole rice	3	0¾	or	54·8	59·09
Nuchu (broken rice)	0	9¾	or	10·9	11·59
Tanadu (bran)	0	12		13·5	8·75
Kobattu (husk)	0	14¼		16·3	20·57
Loss	0	4		4·5	...
	5	9		100·00	100·00

Remarks of the Divisional Commissioners.

No. 3518 of 1886.

Revenue Department.

Camp Nadiád, 22nd November 1886.

I cannot see the necessity for the proposal in paragraph 3. It would surely be sufficient for the Collector to report carefully the number of tolás in the local ser, or (still better) to eliminate the ser altogether and use *pounds* only.

2. In these experiments, the ser, which in this Division is taken at one uniform measure = 40 tolás, represents in different localities in the other two Divisions, the following weights, *viz.*, 20 tolás, 80, 110, 120, 121, 140, 142, 142½, 148, 150 and 153 tolás! It is scarcely credible that a single measure should vary so much, and the fact affords strong evidence of the necessity for the substitution of an uniform standard.

3. The procedure recommended in the Director's paragraph 4 will be not unlikely to cause confusion. The *second* comparison ought not to be necessary if a fairly representative field is selected with an ordinary, average, 12-anna crop. In fact the usefulness of an experiment depends upon such condition being fulfilled. By the selection of a crop greatly over or under the average, the results may be misleading and not improbably *mischievous*.

4. Mr. Ozanne's remarks on the formulæ for wheat in Ahmedabad and for tobacco in Kaira might perhaps be communicated to the Survey Commissioner. I would not attach too much value to the single experiment in Dhandhuka, but I am inclined to think that as regards Kaira tobacco some modification is desirable. In Nadiád (the best tobacco-producing táluka) from 70 to 75 Bengal maunds is considered an average (12-anna) crop, producing from 1,500 to 2,000 lbs. of cured leaf.

5. I cannot but regard the experiment alluded to in Appendix B. as an unfortunate one, illustrative of my remarks in paragraph 3 above. The rayat's condition is exceptionally favourable. He is not in debt, and has no young family to feed. He sells every maund of his rice, and lives only on coarse grain, apparently without salt or condiments. He spends nothing on tobacco or other small luxuries, and yet the result of his year's labour "is not sufficient to pay the assessment, and charges for clothing and charity," much less to cover interest on his capital!

6. The crop conditions must have been something more than "unfavourable," and I think it is to be regretted that a more representative case was not selected.

G. F. SHEPPARD,
Commissioner, N. D.

No. 3461 OF 1886.

REVENUE DEPARTMENT.

FROM

W. H. PROPERT, ESQ.,
Commissioner, S. D.;

To

T. D. MACKENZIE, ESQ.,
Acting Chief Secretary to Government.

Poona, 22nd November 1886.

SIR,

I have the honour to state that I have no remarks to offer on the printed report on the Crop Experiments made in this Presidency during the year 1885-86 forwarded to me by the Director of Agriculture with his memorandum No. 2475, dated 4th instant.

I have the honour to be,
Sir,
Your most obedient Servant,
W. H. PROPERT,
Commissioner, S. D.

No. $\frac{R.}{5548}$ OF 1886.

FROM

ARTHUR CRAWFORD, ESQ.,
Commissioner, C. D.;

To

THE SECRETARY TO GOVERNMENT,
Revenue Department.

Poona, 30th November 1886.

SIR,

I have received from the Director of Agriculture a copy of his report on Crop Experiments for 1885-86, and beg to offer the following remarks on it.

2. The number of experiments conducted during 1885-86 was small in consequence of the reduction of expenditure ordered in Government Resolution No. 4466, dated 3rd June 1885, the experiments being confined to selected crops

in the Khándesh, Násik and Poona Districts of this Division. The crops experimented upon were chiefly wheat, linseed and sugarcane.

3. In Khándesh one important experiment with wheat was carried out by Mr. H. A. Hughes, Assistant Collector, with satisfactory results. Three others were conducted by Mr. Shridhar Gundo, District Deputy Collector. A similar experiment was made in the Násik District by the District Deputy Collector, Mr. Vádekar, at Ugaon in the Niphád Táluka, the yield reported being very high.

4. Mr. P. C. H. Snow, Assistant Collector, conducted an experiment in the Poona District on cane of the large white variety at Ghorpadi in the Haveli Táluka with extremely good results.

5. Linseed was selected for inquiry in Khándesh and three experiments are reported on it. Besides the experiments on selected crops, one on bájri at Jaithan in the Nizámpur Petha of Khándesh District by Mr. Shridhar Gundo and another on groundnut at Chinchkhed in the Edalabad Petha by Mr. L. G. Deshmukh were rejected, the test area having been below the prescribed minimum.

6. Mr. Ozanne's suggestions in paragraph 4 of his letter regarding the entry of the local estimate of the crop in annas in column 12 of the Standard Form should, undoubtedly, be adopted in order to secure accuracy and uniformity.

I have the honour to be,
Sir,
Your most obedient Servant,
ARTHUR CRAWFORD,
Commissioner, C. D.

No. 1382 OF 1887.

REVENUE DEPARTMENT.

Bombay Castle, 4th March 1887.

FROM
T. D. MACKENZIE, ESQ., C. S.,
Acting Secretary to Government;

To
J. A. BAINES, ESQ.,
Acting Director of Agriculture,
Bombay.

SIR,

Adverting to the analysis of crop experiments for 1885-86 forwarded to Governmont with Mr. Ozanne's letter No. 2422, dated 29th October last, I am desired by His Excellency the Governor in Council to communicate to you the following remarks regarding Appendix B., page 20, and to request you to be good enough to favour Government with your opinion as to the amendment of the rules regarding crop experiments.

2. It will be seen from the report of the experiment alluded to that Mr. Charles has charged one year's consumption of grain, 3 lbs. a day, in his estimate of the cost of home labour of the rayat and his wife who cultivated the holding. It appears to Government to be doubtful whether this item should be included in what should be a valuation on proper economic principles as

stated at the end of Rule 10 of the Standing Orders. The "value of the labour" of the man and his wife, *i.e.* 'wages' is more than a bare food allowance of grain *for the days that they gave labour*, but it may or may not be equal to 3 lbs. of grain for 365 days. For a man and his family to "subsist solely upon the produce" of his holding, it must of course give them much more than this, and it does not seem wise to take out a certain weight of grain as a deduction on account of food to the family, when other necessaries are not charged as deductions. There might be some object in making this deduction if the grain itself were consumed by the family, but there appears to be none where, as in this case, it is converted into money for the purchase of a cheaper food.

3. The result of the estimate on this experiment would, His Excellency is of opinion, be better shown if this item were omitted from the "deductions," and the surplus left—after charging necessary expenses in grain, in cash, and the assessment—were given to meet wages and profits, if any.

4. As a matter of fact a 4½ anna crop in a seventeen rupees holding could not be expected to keep a man and his wife and four bullocks for 365 days, and probably did not *employ* them more than half that time; but it is plain that an *average* crop would give them a profit.

5. The fallacy is so common both in Ireland and in India that an agriculturist and his family must be provided for *a year* by his "land," whether it employs him 100 or 300 days, that it is desirable to remove this item from the estimates as calculated to give countenance to this fallacy.

6. It seems to Government that the subsistence of the agriculturist is a special question which should not be mixed up with these statistics, of which the main object is to show the incidence of the assessment. This, however, can only be done if the experiments are conducted—

(*a*) on the same land,

(*b*) over a series of years,

(*c*) after deducting the two worst and the two best years,

(*d*) stating the annual produce in rupees, and not as in paragraph 4 of Mr. Ozanne's letter,

(*e*) selecting neither the best nor the worst fields, or

(*f*) the best or the worst cultivators.

Government are not convinced that these crop experiments may not be misleading. If they are purely departmental, and if they deal with definite figures and not with varying local estimates of bumper and average crops, some day trustworthy conclusions may be drawn from them. It appears to Government that the experimenters should only collect *facts*, and the deductions from these *facts* should be drawn with great circumspection by the Agricultural Department.

I have the honour to be,
Sir,
Your most obedient Servant,

T. D. MACKENZIE,
Acting Secretary to Government.

No. 953 of 1887.

FROM

E. C. OZANNE, ESQ.,

Director of Agriculture,

Bombay;

To

THE SECRETARY TO GOVERNMENT,

Revenue Department,

Bombay.

Poona, 8th June 1887.

SIR,

I have the honour to submit the report called for in Government letter No. 1382, dated 4th March 1887.

2. The point at issue is, whether in a *special* experiment as defined in the Standing Orders on crop experiments, the cost of cultivation should be debited with the charge prescribed by the Standing Orders for the value of the labour of the occupant of the selected holding and his family.

3. If the selected holding fulfils the conditions prescribed in Section 3 of the Standing Orders, *i. e.*, if it is one which occupies fully the time and labour of the holder and his family, it seems fair to charge the bare subsistence rates for the *whole year* as part of the cost of cultivation. As pointed out by Government, wages are more than a bare food allowance of grain for the days of labour. I agree with this, and would urge that the bare food allowance for the whole year is as fair an estimate of the wages of the occupant and his family for the actual days of work as could be devised. I do not think that the fallacy indicated—*viz.*, that a rayat must be provided by his land for the *whole* year, whether it employs him 100 or 300 days—enters necessarily into the computation prescribed for the guidance of experimenters. The words "occupies fully" in the Standing Orders clearly mean "occupies the cultivating season", *i.e.*, the time for preparing the land, sowing the crops, watching and weeding, harvesting and preparing for the market. However fully the rayat's time is employed, there must be slack times, when he must be kept by his land, even though he is not actually employed in field or other work in connection with his land.

4. The typical holding is not easy to find, and it is not intended that experimenters should always select one exactly fulfilling the conditions of such a holding. But if the information collected is as full as it should be, it is not impossible for the experimenter or for me, whose duty it is to analyse experiments, to make due allowances and modifications.

5. With reference to the last paragraph of the letter under reply, I would urge that the agriculturist's subsistence is not mixed up with the statistics designed to show the incidence of the assessment, but the incidence of the assessment on *nett* produce cannot be arrived at until the cost of cultivation has been deducted, and this cost must include a fair charge for home labour.

6. It is necessary to explain that the grain deduction is *usually* made on the grain which is both raised and consumed by the rayat. But in Mr. Charles' experiment a modification was called for, because it was not probable that the small farmer with whom he was dealing, would eat so expensive a grain as rice, though it happened that this was the crop he grew and grows.

7. I do not quite understand the modification suggested in paragraph 6, clause 4, of the Government letter. The produce is always stated in rupees, but the local estimate is also required in annas, in order that the result may be compared with that of other seasons—in fact that the varying effect of season may be properly considered.

8. The special experiment is not yet well understood and few Assistant Collectors have the aptitude for and interest in the subject, which are requisite

for a really satisfactory report. The Agricultural Department, when it has leisure and trained agency, may secure better results than heretofore; but, as matters stand, the principal benefit from such experiments is that accruing to the experimenter. I urge that the Assistant Collectors, who are at head-quarters during the principal cultivating season, have little opportunity or inducement to study cultivation and to learn anything at all about the agricultural practice of the people, and yet I believe it will be admitted that some knowledge of these subjects is essential to the proper administration of a rayatvári district. By making experiments on crops and by collecting the detailed information required for special experiments, the Assistant Collector must learn much which will be very valuable to him.

Lastly, I would respectfully represent that I do not report the whole of the Assistant Collectors' reports, but that I analyse them and thus am responsible that misleading results are not published.

I have the honour to be,
Sir,
Your most obedient Servant,
E. C. OZANNE,
Director of Agriculture,
Bombay.

Crop Experiments: Report on the —— for 1885-86.

No. 4461.

REVENUE DEPARTMENT.

Bombay Castle, 15th July 1887.

Letter from the Director of Agriculture, No. 2422, dated 29th October 1886—Submitting through the Commissioners of Divisions the usual analysis of crop experiments carried out by Revenue officers during the year 1885-86.

Memorandum from the Commissioner, N. D., No. 3518, dated 22nd November 1886—Submitting his remarks on the report by the Director of Agriculture on crop experiments for 1885-86.

Letter from the Commissioner, S. D., No. 3461, dated 22nd November 1886—Stating that he has no remarks to offer on the report.

Letter from the Commissioner, C. D., No. R.—5348, dated 30th November 1886—Submitting his remarks on the report.

Letter from Government to the Director of Agriculture, No. 1382, dated 4th March 1887—Communicating certain remarks regarding Appendix B, page 20 of crop experiments report, and calling for opinion as to the amendment of the rules regarding crop experiments as suggested therein.

Letter from the Director of Agriculture, No. 953, dated 8th June 1887—Submitting the report called for in Government letter No. 1382, dated 4th March 1887.

RESOLUTION.—The two factors in question are—

1.—What is the average produce?

2.—What does the land owe to the rayat in wages and interest?

The former can only be satisfactorily settled if the experiments are conducted (*a*) on the same land, (*b*) over a series of years, (*c*) after deducting the two worst and the two best years, (*d*) stating the annual produce in rupees, (*e*) selecting neither the best nor the worst fields nor (*f*) the best nor the worst cultivators. Though any mere estimate of the proportion of crops to the average made in a single year must necessarily be unsatisfactory, still these experiments are useful as all *facts* are, and especially, for the reasons advanced by the Director, are they useful to Revenue officers.

2. But the second issue can *never* be settled satisfactorily. Beside the infinite variations in skill and industry it is impossible to ascertain the actual labour of the family expended in the simplest processes for the production or the preparation of a crop for the market. Mr. Ozanne is of course right that the cost of production must include "a fair charge for home labour" but the question is, what is a fair charge? and Mr. Ozanne is wrong in saying that the agriculturists' subsistence is *not* mixed up with the statistics. It is most distinctly mixed up, for Mr. Charles' experiment charges the crop with 3 lbs. of grain for a year towards subsistence and the result is brought out that "the balance is not sufficient to pay the assessment."

3. The Governor in Council considers therefore that this item should be omitted. There is much risk in retaining it as unless statistics are accurate they are worse than useless, and this item is admittedly beyond verification.

T. D. MACKENZIE,
Acting Secretary to Government.

To

The Director of Agriculture,
The Commissioner, N. D.,
The Commissioner, C. D.,
The Commissioner, S. D.,
The Commissioner in Sind,
All Collectors in the Presidency Proper,
The Accountant General,
The Survey and Settlement Commissioner. } With copies of the report.

The Government of India,
The Secretary of State for India. } By letter.